REMARKS

Review and reconsideration are requested.

Claims 1-4 and 10-13 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,296,008 to Moriguchi et al or U.S. Patent 4,745,022 to Miyake et al, or any of JP 04-136174, 06-246511 or 06-063804 (all Mitsubishi Materials Corp) or JP 10212183. The Examiner considered each of the cited references as disclosing the claimed coating on the claimed silicon nitride and having the claimed amount of sintering aids. Because the disclosed silicon nitride and coating are said to be the same as that of the invention, the Examiner considered that the prior art silicon nitride members would inherently meet the claimed bending strength.

Applicant traverses, and respectfully requests the Examiner to reconsider for the following reasons.

As claimed in claim 1, the present invention is directed to a silicon nitride member comprising a substrate formed by centering a silicon nitride material, and a hard film comprising a hard component selected from the group consisting of Al_2O_3, TiCN, TiN and TiC formed on a surface of the substrate. The silicon nitride member is characterized in that the strength of the silicon nitride member measured after the substrate is coated with the hard film is 70% to 95%.

As claimed in claim 3, the silicon nitride member is characterized in that the amount of grain boundary phase present at certain depths from the surface of the substrate meets at least one of conditions (1) to (5). For example, as stated in (3), the amount of grain boundary phase as measured in the vicinity of a depth of 300 μm from the surface of the substrate is 50% to 70% by volume (relative to the content at a central portion of the substrate taken as 100% by volume).

The silicon nitride member (see claim 7) is manufactured by a technique which includes the steps of:

(1) heating the substrate of the temperature in a range of from 1800°C to 1900°C for 60 to 180 minutes in an nitrogen atmosphere pressurized at from 2 to 6 atmospheres;

subsequently lowering the temperature to a range of 1550°C to 1650°C; and

(2) maintaining the substrate at a reduced temperature for 60 to 180 minutes under a reduced pressure of not higher than 13 kPa.

That is, the claimed silicon nitride member is made by a primary sintering process which includes two distinct steps differing in both temperature and pressure. That is, the silicon nitride member of the present invention, characterized in terms of strength of the silicon nitride member measured after the substrate is coated with the hard film and grain boundary phase content, is achieved by a two-step primary sintering process.

More particularly, in order to maintain good wear resistance and a certain level of resistance to chipping of the silicon nitride member coated with a hard film, an important consideration is to control volatilization of the grain boundary, which is formed on the surface of a substrate during sintering of the substrate, so as to establish an appropriate amount of the grain boundary phase, for example, a grain boundary phase in an amount of less than 5% by weight. See, for example, page 4, lines 4-16 of the specification.

Turning to the prior art, all of the references cited by the Examiner describe sintered silicon nitride materials made by a primary sintering process consisting of a single step. For

example, U.S. Patent 4,745,022 to Miyake et al describes that each of the obtained powder mixtures was merely hot pressed to obtain a sintered specimen having a size of 14 mm x 14 mm x 6 mm (see the Example at column 8, lines 9-11). A single sintering step is described at column 7, lines 19-22, namely, sintering at a temperature lower than 1800°C, and preferably at a temperature between 1650°C and 1800°C. There is no mention or disclosure of a two-step primary sintering process.

U.S. Patent 5,296,008 to Moriguchi et al describes sintering a preformed compact in a pressure sintering furnace in a gaseous nitrogen atmosphere at a pressure of 5 atm. absolute at 1800°C. See Example 1 at column 7, lines 33-35. Moriguchi et al also generally describes sintering in a nitrogen atmosphere at a temperature 1700°C to 1900°C under a pressure of a nitrogen atmosphere (column 4, lines 53-59), but there is no disclosure of a two-step primary sintering process as employed in the invention.

Similarly, JP '174, JP '511, JP '804 and JP '183 each describes a one-step primary sintering process.

Because the prior art employs only a single-step sintering process, volatilization of the grain boundary phase is not controlled, resulting in a sintered silicon nitride material that does not have an appropriate amount of grain boundary phase and therefore does not meet the terms of the present claims. Criticality in the second step of the sintering process is clearly seen by reference to Tables 1 and 2 at page 20 and 21 of the specification. Notably, the comparative examples subjected to a second-step sintering temperature or pressure outside the scope of present claim 7 did not produce a product having the requisite amount of grain boundary phase.

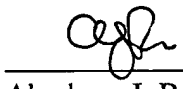
For the above reasons, it is respectfully submitted that the cited references do not anticipate the present claims, and withdrawal of the foregoing rejection under 35 U.S.C. § 102(b) is respectfully requested.

Furthermore, independent method claims 5 and 6 include all of the limitations of amended product claims 1 and 3, respectively. If the product claims are found to be patentable, then Applicant respectfully requests rejoinder of the non-elected claims pursuant to MPEP § 8204.

Withdrawal of all rejections and allowance of claims 1-13 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

Respectfully submitted,



Abraham J. Rosner
Registration No. 33,276

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: November 13, 2003